PUFFER LAKE

Introduction

Puffer Lake is high in the Tushar Mountains east of Beaver. While it is not particularly large, it is the largest natural lake found in the Tushars.

The area around the reservoir is privately owned but access is unrestricted. Defined beneficial uses include: water recreation excluding swimming; propagation of cold water species of game fish and aquatic life; and agricultural needs.

Characteristics and Morphometry

Lake elevation (meters / feet)	2,948 / 9,672
Surface area (hectares / acres)	26.3 / 65
Watershed area (hectares / acres)	706 / 1,744
Volume (m^3 / acre-feet)	
capacity	1,106,451 / 897
conservation pool	0
Annual inflow (m^3 / acre-feet)	
Retention time (years)	
Drawdown (m^3 / acre-feet)	552,603 / 448
Depth (meters / feet)	
maximum	15.2 / 50
mean	4.5 / 14.8
Length (meters / feet)	1,010 / 3,609
Width (meters / feet)	500 / 1,640
Shoreline (km / miles)	2.5 / 1.5

Location

County	Beaver
Longitude / Latitude	111 22 00 / 38 18 09
USGS Map	Delano Peak, Utah, 1981
Cataloging Unit	Beaver River (16030007)

Recreation

Puffer Lake is 18 miles east of Beaver and 16 miles west of Junction on U-153. The highway from Beaver is paved, while the highway from Junction, although steep, is gravel and maintained in good condition. Currently efforts are underway to widen and improve the road from the reservoir towards the east.

Puffer Lake and the surrounding area is entirely privately owned by the Puffer Lake Resort, but public access is permitted through agreements with DWR that allow for fishery access to the lake. Facilities at the resort include: camping, cottage rental, boat rental, boat launching, fishing,

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picnicking, showers, horseback riding, and a convenience store. Puffer Lake receives heavy fishing pressure during the summer season.

The nearest USFS campground, Mahogany Cove, has 7 campsites, vault toilets, and picnic facilities. Fees are charged. It is 7 miles west of Puffer Lake on U-153. There are also several private campgrounds in Beaver.

Watershed Description

The reservoir is in a deep glaciated valley south of Mount Holly in the Tushar Range. The watershed high point, the south shoulder of Mount Holly, is 3,597 m (11,800 ft) above sea level, thereby developing a complex slope of 19.8% to the reservoir. The inflow and outflow is Lake Stream, and the average stream gradient above the reservoir is 8.8% (647 feet per mile). Cullen Creek also flows into the reservoir.

The soil is largely of volcanic origin with moderate permeability and moderately slow erosion and runoff.

The vegetation communities are comprised of pine, aspen, spruce-fir, oak, maple and alpine vegetation. The watershed receives 76 - 102 cm (30 - 40 inches) f precipitation annually with a frost-free season of 0 - 20 days at the reservoir.

Limnological Assessment

The water quality of Puffer Lake is good. It is considered to be soft with a hardness concentration value of approximately 54 mg/L (CaCO3). Those parameters that have exceeded State water quality standards for defined beneficial uses are total phosphorus, pH and dissolved oxygen. Although the average total phosphorus concentration in the water column was above the state pollution indicator (25 ug/L) in 1981 and 1989, it was well under in 1991 with a concentration of only 7 ug/L, which appears to be abnormally low. Elevated pH values develop as algal bloom develop later in the year and are associated with photosynthesis. With the drawdown of the lake macrophytes become more predominate with the increased algal blooms. This high production of organic matter poses a concern for the overwintering of fish in the lake due to the large demand for oxygen required in the decomposition process of this material. On March 22, 1990 a survey of the lake was conducted to ascertain the effect of decomposition during the winter on the lake. Data obtained indicated that the reservoir was anoxic and the average concentration of total phosphorus in the water column was 381 ug/L. This data substantiates the fact that the oxygen is consumed and phosphorus is released back into the water column from sediments and organic decomposition. These conditions make it difficult to overwinter fish in the lake without the input of fresh oxygenated water into the lake.

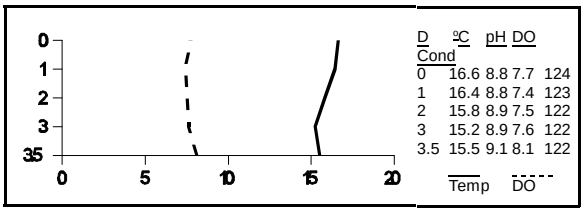
The reservoir is characterized as a nitrogen limited system. TSI values indicate the reservoir is mesotrophic except in 1991 when abnormally low phosphorus concentration skewed the data into the oligotrophic state. The reservoir was not stratified during a summer monitoring trip was on August 14, 1992 but when sufficient depth has been present (1981) the lake did show a week stratification later in the year.

According to DWR frequent partial winter fish kills have occurred in recent years. The reservoir supports population of rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), and cutthroat trout

Limnological Data

Data sampled from STORET site: 594145

Surface Data	1981	1989	1991
Trophic Status	M	M	O
Chlorophyll TSI	-	49.11	37.88
Secchi Depth TSI	44.16	42.37	43.24
Phosphorous TSI	55.41	55.81	27.35
Average TSI	49.7	49.10	36.16
Chlorophyll a (ug/L)	-	6.6	2.1
Transparency (m)	-	3.4	3.2
Total Phosphorous (ug/L)	35	36	5
pH	9	9.1	8.6
Total Susp. Solids (mg/L)	<5	-	<3
Total Volatile Solids (mg/L)	-	-	2
Total Residual Solids (mg/L)	-	-	<2
Temperature (°C / °f)	10/50	14/56	15/58
Conductivity (umhos.cm)	107	129	117
Water Column Data			
Ammonia (mg/L)	0.05	0.014	0.03
Nitrate/Nitrite (mg/L)	0.06	-	0.017
Hardness (mg/L)	56	-	51
Alkalinity (mg/L)	54	-	53
Silica (mg/L)	-	-	9.8
Total Phosphorous (ug/L)	35	42	7
Miscellaneous Data			
Limiting Nutrient	N	N	N
DO (Mg/l) at 75% depth	4.4	12.7	7.6
Stratification (m)	5-7	NO	NO
Depth at Deepest Site (m)	8	3.6	3.5



(*Oncorhynchus clarki*). The lake was treated for rough fish competition in 1957, so populations of native fishes may not be present in the lake.

DWR stocked Puffer Lake with 6,000 catchable rainbow trout and 2,500 fingerling brook trout in 1991.

Phytoplankton in the euphotic zone include the following taxa (in order of dominance)

Species	Cell Volume (mm^3/liter)	% Density By Volume
Sphaerocystis schroeteri	13.205	50.22
Aphanizomenon flos-aquae	11. 6 2 0	44.19
Quadrigula lacustris	1.112	4.23
Fragilaria crotonensis	0.229	0.87
Pennate diatoms	0.073	0.28
Centric diatoms	0.051	0.19
Ankistrodesmus falcatus	0.004	0.02
Total	26.293	
Shannon-Weaver [H']	0.91	
Species Evenness	0.47	
Species Richness	0.26	

The phytoplankton community is dominated by the presence of green and blue-green algae indicative of fair water quality with tendencies toward eutrophic conditions. Macrophyte growth is entirely submergent and fairly heavy.

Information

Fish Lake National Forest	896-4491
Beaver Ranger District	438-2436
Puffer Lake Resort (reservations)	864-2751
Five County Association of Governments	
Division of Wildlife Resources	538-4700
Division of Water Quality	538-6146

Pollution Assessment

Nonpoint pollution sources include: sedimentation and nutrient loading from grazing; and wastes and litter from recreation. Because the immediate area around the lake is privately owned, grazing has been limited near the lake but many cattle do graze throughout the watershed.

There are no point pollution sources in the watershed.

Beneficial Use Classification

The state beneficial use classifications include: boating and similar recreation (excluding swimming) (2B), cold water game fish and organisms in their food chain (3A) and agricultural uses (4).